Bracing and Splinting Workshop

October 8th, 2016
Sports Medicine for Primary Care
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Amy Leu, DO

Bracing vs Splinting?

• Terms often used interchangeably
• In sports medicine distinct difference
• Splinting
  – acute, typically fracture treatment
  – Moldable plaster or fiberglass
  – Removable, not really reusable
• Bracing
  – Acute or chronic injury treatment
  – Durable material varying from canvas, plastic, metal neoprene
  – Reusable
  – Also can be used in fracture management, more common in sprains / strains / post-op
Bracing

- Shoulder – slings, pillow braces
- Elbow – Range of Motion, FA strap
- Wrist – Volar, thumb spica
- Hand / Finger – STAXX, alumifoam, ulnar gutter
- Knee – (sleeve, straps, PF, OA, hinged, ACL)
- Ankle braces (ASO, untape POD brace, aircast)
- Foot – PF night splint, post op shoe
- Sports taping
- K-taping

Bracing

- Uses?
  - Stability
  - Compression
  - Protected weight bearing
- Types?
  - Hinged
  - Sleeves
  - Stabilizers
  - immobilizers
- Bracing vs taping?
Shoulder

• Sling
• Indications:
  – Clavicle Fracture
  – Shoulder Dislocation
  – Shoulder Sprain
  – AC Separation
  – Proximal Humerus Fracture
  – Elbow Injury

Shoulder

• Shoulder immobilizer – has abdominal straps. Used post-operatively
• Clavicle Straps / figure of 8 – can be used vs sling, but:
  – Higher reported pain in the first day of treatment, more difficult to apply (and comply) (1)
Shoulder Sling

Shoulder Immobilizer

Figure 8 brace
Elbow

- Forearm Strap – used for Tennis Elbow / Lateral Epicondylitis
  - Placed over the Extensor Wad

Elbow

- Range of Motion Brace
  - Controls elbow motion
  - Radial head / neck fracture
  - Elbow Dislocation
  - UCL Injury
Wrist

• Volar Wrist – Thumb and fingers are free
• Indications
  – Wrist sprain
  – Wrist OA
  – Carpal Tunnel

Wrist

• Thumb Spica – stabilizes wrist and thumb
• Indications
  – CMC Arthritis
  – De Quervain’s
  – Thumb Sprain
  – EPL tendonitis
  – If worried about scaphoid fracture can use this while awaiting re-image / MRI
Hand / Finger

• STAXX – Mallet finger, nail injuries

• Alumifoam – sprains, simple fractures

Hand / Finger

• Ulnar Gutter / Boxer’s Fracture
  – Traditionally treated with a cast
  – In select patients can consider bracing
  – Recent systematic review suggests that reduction + cast not superior to soft wrap without reduction (2)
Knee

- Sleeve
- Immobilizer
- Hinged
- Patellar stabilizer
- Functional ACL / Custom
- Medial unloader
- Patellar Strap

Knee

- Immobilizer
  - Keeps knee straight
  - Injury, sprain, early ligament injury
  - Early patellar dislocations
  - Patellar, quad ruptures
  - ER discharge favorite
- Sleeve
  - Compression, warmth
  - NO stability
Knee

- **Patellar Stabilizer**
  - May help with patellar tracking
  - PFS, Patellar instability

- **Patellar Strapping**
  - Sits just below patella, may surround
  - Patellar tendonitis

Knee

- **Hinged**
  - Allows flex/ext, provides med/lat stabilization
  - Sprains, ligament, meniscal injury

- **Functional ligament injury brace – custom fit.** Post op use, or non-op management of tears
Knee

• Unloader
  – Shifts anatomical alignment on the knee to off-load the arthritic compartment
  – Isolated OA (medial or lateral)
  – MUST SPECIFY SIDE. TIGHT FITTING

Ankle

• Ankle Brace
  – Stabilize and protect the joint
  – Many varieties: lace up, velcro, Air cast, active ankle, “untape POD”
• Sleeves, ACE wrap
  – Compression, little support
Ankle

• CAM Walker
  – Stiff boot that stabilizes ankle and foot with rocker bottom
  – Short and Tall
• Indications:
  – Severe ankle sprain
  – Achilles tendonitis / partial tear
  – Minor ankle fracture
  – Some MT fractures
  – Stress fractures

Foot

• Plantar Fascia Night Splint
  – Rigid vs soft
Foot

- Post-op Shoe – rigid sole, prevents toe-off/extension. Stabilizes midfoot somewhat
- Indications:
  - Metatarsal stress fractures
  - Turf toe
  - Foot sprains

Brace vs tape?

- Athletic / Sports tape
- Kinesio tape
- Not much difference in lateral ankle sprain recurrence at one year when treated with bracing vs. taping (3)
- Taping tends to be less comfortable, more skin complications, and more expensive than bracing (4)
Tape

References


Demonstration
**Shoulder Exam**
Jeff Anthony DO, FAAFP, FAOASM
San Diego Sports and Family Health Center
SDSM.COM

**Shoulder:**
Bones, muscles, joints
Joints: GH, AC, Sternoclavicular, Scapulothoracic
GH joint is the most dislocated large jt. in the body
ST joint: Trapezius, Serratus Anterior, Rhomboids, Levator Scap.

**History:** key to diagnosis

<table>
<thead>
<tr>
<th>Key Findings in the History and Physical Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FINDING</strong></td>
</tr>
<tr>
<td>Scapular winging, trauma, recent viral illness</td>
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<tr>
<td>Seizure and inability to passively or actively rotate affected arm externally</td>
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<tr>
<td>Supraspinatus/infra spinatus wasting</td>
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<tr>
<td>Pain radiating below elbow; decreased cervical range of motion</td>
</tr>
<tr>
<td>Shoulder pain in throwing athletes; anterior glenohumeral joint pain and impingement</td>
</tr>
<tr>
<td>Pain or &quot;clunking&quot; sound with overhead motion</td>
</tr>
<tr>
<td>Nighttime shoulder pain</td>
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<tr>
<td>Generalized ligamentous laxity</td>
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</tbody>
</table>

AAFP May 2000
**Examination**

**Observe:** symmetry, deformity, atrophy, scars, winging. Compare with other side.

**Palpate:** clavicle, acromion, coracoid, muscles. Also C spine

**ROM:** Active, passive

- Flex: 180 Ext: 50
- ABD: GH and ST motion; also pronation, supination
- ER: elbow at side: 60 deg. Capsulitis, GH arthritis restricts
- IR: compare with other side, at least T7

**Horizontal IR / ER**

**MS strength:** Primarily checking RC
- ER: infraspinatus/Teres Minor
- ABD: supraspinatus. ‘Empty can test’.
- IR: Subscapularis, belt left off

**Testing:**

- Yergasons: palpate bicipetal groove
- Scarfs: primarily for AC
- Impingements:
  - Hawkins: flex 90, IR
  - Neers: arm full flexion
- Drop arm test: passive abd., active lowering: test for RC tear
- Obriens: 90 flex, adduct 20 deg., then supinate vs pronate
- Sulcus test: inferior instability
- Instability: ant and posterior drawer
- Apprehension test; then relocation
- Clunk or grind: labral disorder
- Spurlings: test for cervical radiculopathy
Introduction to Osteopathic Medicine

Michael Kurisu DO
Department of Family and Preventative Medicine,
University of California at San Diego

Osteopathic ...

• History
• Philosophy
• Pathophysiology
• Practice
• Evidence
Osteopathic History

– AT Still MD, Kirksville Missouri
– 3 Tenets
– Concept of Health
– Restoration of Balance
– Host + Disease = Illness

1st Osteopathic Principle

The body is a unit
Body Unity

- The “Body” is comprised of interrelated systems of function, each dependent on the others for its regulation and effect
- Body unity is governed by the premise that the whole is greater than the sum of its parts
- This tenet focuses the physician’s attention on the totality of the patient’s clinical presentation (Holistic Philosophy, Mind/Body/Spirit Paradigm)

2nd Osteopathic Principle

The body is capable of self-regulation and self-healing
"Within man’s body there is a capacity for Health. If this capacity is recognized and normalized, disease can be both prevented and treated.”
~ A.T. Still

3rd Osteopathic Principle
Structure and function are interrelated
Sickle Cell Disease: structure and dysfunction
Pathophysiology

- Models of Osteopathy
  - Biomechanical
  - Reflex
  - Fluid
  - Neurological
  - Energetic/Spiritual

Osteopathy

Biomechanical Model

- Tensegrity
Biomechanics: Macroscopic to Microscopic

- Cranial bones of a newborn
  - allows overlap for birthing process
- Muscles
  - origin & insertion
  - fiber type
  - shape
- Wolff’s Law
  - bone is laid down along lines of stress
- Vascular structures
  - active vs. passive
- Joints of the body
  - stability vs. mobility
Joint Structure & Function

Shoulder

Mobility
 Stability

Elbow

↑  ↓
↓  ↑

Osteopathy Reflex Model
Reflex

- **Somato-Visceral reflexes**
  - Irvin Korr, PhD
  - somatic dysfunction can cause reflex sympathetic activity in the viscera
- **Visceral-somatic Reflexes**
  - Visceral dysfunction can cause reflex sympathetic activity in the paravertebral musculature of the associated spinal level
- **Somato-Somato Reflex**
- **Visceral-Visceral Reflex**
- **Somato-Visceral-Psycho-Ethereal**

Autonomic Reflex Arc
GI tract: ANS innervation

Sympathetic Chain Ganglia anterior to rib heads
Osteopathy
Fluid Model

• Life = Motion
• Our bodies are meant for movement
• Systems
  – Cardiovascular
  – Musculoskeletal
  – Respiratory
  – Neurological
Life = Motion
Osteopathy
Neurological model

- Endorphins
- Enkephalins
- Effects on Immune System

Neurological

- Pain stimulus originates in tissue, transmission via peripheral afferents to spinal cord
- Return through dorsal horn, synapse with interneurons, transmission to CNS, thalamus, cortex (perception)
- Involvement of proprioceptors
- Reciprocal changes to musc skel system
- Acute, Chronic (>3 months)
Osteopathy
Energetic Model

- Energetic / Spiritual
  - Meridians, Chi
  - Chakras
  - Palpation of inherent energetic system of body energy
  - Transfer from practitioner to patient

Application of Theory and Osteopathic Treatment

**Indication for Treatment:** Somatic Dysfunction

- “Impaired or altered function of related components of the somatic (body framework) system: skeletal, arthrodial, and myofascial structures and related vascular, lymphatic, and neural elements.”
Manual Medicine
Diagnostic Parameters

• Somatic Dysfunction
  – ICD9 Coding
• Osteopathic Manipulative Treatment
  – CPT Codes

“Any variation from Health has a cause. It is the business of the osteopath to locate and remove it [the cause], doing away with the disease and getting Health instead.”
~ A.T. Still, M.D.

Research & Practice
Host + Disease = Illness

- Pasteur, Bernard, and Virchow
- Osteopathy is concerned with how each individual body responds to their disease

Osteopathic Manipulative Medicine

- One of many modalities an osteopathic physician may offer as a treatment to a patient
- Based on the 3 principles of osteopathy
- Hands-on diagnosis and treatment of a patient
### Osteopathic Techniques

<table>
<thead>
<tr>
<th>Direct</th>
<th>Indirect</th>
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<tbody>
<tr>
<td>– High Velocity/ Low Amplitude</td>
<td>– Cranial Technique</td>
</tr>
<tr>
<td>– Springing</td>
<td>– Facilitated Positional Release</td>
</tr>
<tr>
<td>– Muscle Energy</td>
<td>– Biodynamics</td>
</tr>
<tr>
<td>– Articulatory</td>
<td>– Myofascial Release</td>
</tr>
<tr>
<td>– Balanced Ligamentous Tension</td>
<td>– Trigger Point Release</td>
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<tr>
<td></td>
<td>– Strain/Counterstrain</td>
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<td></td>
<td>– Visceral</td>
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### Osteopathic Medicine

The Evidence
Osteopathic Medicine
The Evidence

• Difficulty of standardizing treatments and responses, the apparent lack of inter-examiner agreement, and the self-limited natural history of many musculoskeletal conditions.
• Additionally, a completely double-blinded trial of manipulation is impossible because the third level of blinding cannot be met, ie, the treating clinician knows what treatment was rendered

Osteopathic Medicine
The Evidence

• 1995: Agency for Health Care Policy and Research (AHCPR) consensus:
  – Manual therapy can be effective at reducing acute pain and decrease symptoms in initial 1-4 weeks of treatment
  – recommended manipulation as safe and effective for acute LBP
Osteopathic Medicine
The Evidence

- Osteopathic manipulation vs. standard care
- 12 weeks both groups with improvement
- OMT: Less medication and less Physical Therapy


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Osteopathic Medicine
The Evidence

- 1993 Meta analysis 58 articles
- 25 RCT spinal manipulation
- Spinal manipulation is of short-term benefit in some patients, particularly those with uncomplicated, acute low-back pain.

Osteopathic Medicine
The Evidence

- 1996 Meta analysis 36 RCT
- Spinal manipulation vs. standard treatments
- Over half of trial showed manipulation favorable
- 6/16 showed efficacy at 3 months

  Koes Spine 1996 Dec 15;21(24):2860-71

Osteopathic Medicine
The Evidence?

- Spinal manipulative therapy for low back pain meta analysis of effectiveness relative to other therapies.
- 39 RCT
- Acute pain: SMT superior only to sham or ineffective or harmful therapies
- CONC: no evidence is superior to standard treatments for acute or chronic LBP
Osteopathic Medicine
The Evidence $$

- UK BEAM (back exercise and manipulation)
  - Spinal manipulation cost effective addition to general practice care
    *BMJ 2004*

- 4 year retrospective claims data analysis
  - 700,000 members managed care plan
  - Members with chiropractic care access had decreased annual total health care expenditure

  *Williams Fam Pract 2004*

A non-scientifically put together evidence based most effective list

- LBP
- Cervicalgia
- Headache
- Piriformis
- TMJ
- Whiplash
- Sinusitis

- In general, treatment may decrease time to heal and allow decrease use meds
- Often give relief for non surgical options
CONCLUSION

• Continued study into efficacy needs to be done

• In general:
  – procedures are extremely low risk
  – have a high degree of patient satisfaction
  – often result in decreased use of medications

Life = Motion
Resources

One has to examine the right and left, upper and lower parts of the body, make the upper and lower parts connect. Feel and palpate the body to find something with your hands, then take the disease away with the needle using correct points. This is the rule, according to the rule, one can remove disease.

Miraculous Pivot
TCM Channel Systems

365 Common Acupuncture Points
12 Primary Channels
  - External and Internal Pathways
8 Extraordinary Vessels
12 Collateral Channels
  - Divergent
  - Connecting
  - Sinew
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  - Sinew

Deadman, P. A Manual of Acupuncture
Internal/External
Agonist and antagonist muscle groups

Six Divisions
Opposing upper and lower extremity flexors, extensors abductors, adductors, rotators.

Midday/Midnight
Opposing upper and lower extremity flexors, extensors abductors, adductors, rotators.
Sinew Channel Evolution

Originally described in Chapter 13 of the Ling Shu - 2nd century BC.
Tom Myers – Anatomy Trains 2002

Fascial Connections

Fascia Research Society defines fascia as:

“A connective tissue that interweaves and connects all parts of the human body and is a body-wide tensiational force transmission network.” (Klinger, W. 2015)
Muscle fascia forms a continuous honeycomb, an interfascial trabecular system that is interconnected providing mechanically competent links (Passeriux, 2007).

Force generated by muscle is transferred to bones via tendons to produce movement. However, this force is not only transmitted via myofibrils but also with fascial continuity between epimysium, perimysium, endomysium and across the paratenenon, epitenon and endotenon and onto the next myofascial segment (Huijing, 2009).

For decades, muscles have been thought of their role in eccentric, concentric and synergist actions and defined by their origins and insertions on bony attachments. Thinking more systemically and in light of recent research, force transmission is more about myofascial groups than that of individual muscles. No representation of individual muscles has been found within the sensory or motor cortex of the brain. (Williams, 1995)

The topology of muscle contraction together with fascial plane movements (perimysium) and in between them (intermuscular septum) during motion are far more complex than we have previously assumed (Fukunaga, 2012)
Fascial Connections

The interconnected myofascial chains create force transmission that pulls in a relatively straight line and do not have any structures which cut through the line.

Fascial Connections

The interfascial system favors force transmission not only along the muscle/tendon complex but along the connecting myofascial tissues (Purslow, 2010).
The Kidney sinew channel follows the adductor magnus and is continuous with the MCL and onto medial soleus.

Fascia and Proprioception

During the International Fascia Research Congress, held at Harvard Medical School in 2007, three teams from different countries reported, independently, their findings of a rich presence of sensory nerves in fascial tissues (Schleip, 2015).
Fascia and Proprioception

The nervous system seems to be around six times more proprioceptively interested in what goes on in the fascial matrix than it does in detecting changes in the muscle itself (Van der Wal, 2009).

About 80% of all peripheral nerve afferent fibers come from the myofascial tissue. The body wide connective tissue network is certainly our most important organ for proprioception (Schleip, 2003).

Fascia and Proprioception

The superficial fascial layers of the body are, in fact, much more densely populated with proprioceptive nerve endings than the connective tissues situated internally. In particular, the transition zone between the fascia profunda and the subdermal loose connective tissue seems to have the highest sensorial innervation (Tesarz, 2011).
The mysterious “acupuncture meridians,” may also be related to connective tissue, as they seem to be located along connective-tissue planes between muscles, or between muscle and bone. We have found that more than 80 percent of acupuncture points in the arm are located along connective-tissue planes (Langevin, 2002).

Because the structure and composition of interstitial connective tissue is responsive to mechanical stimuli, we propose that acupuncture plays a key role in mechanotransduction signaling and the integration of several physiological functions (Langevin, 2002).
The mechanical stimulation of connective tissue generated by acupuncture needle manipulation could transmit a mechanical signal to sensory nerves (Langevin, 2002).

Acupuncture needle stimulation that results in the spreading of collagenous matrix deformation and cell activation along connective tissue planes may mediate acupuncture effects remote from the acupuncture needle site (Langevin, 2002).
The vast majority of repetitive strain injuries occur in collagenous connective tissue such as tendons, ligaments or joint capsules. Even in so-called “muscle tears”, the specific ruptures rarely occur within the red myofilaments but rather within the white collagenous tissue portions of the overall muscle structure (Hyman, 2000).

It seems that in these instances the respective collagenous tissues have been less adequately prepared and less adapted to their loading challenge than their muscular or skeletal counterparts (Renstrom, 1985), (Counsel, 2010).

Treatment that influences proprioception could augment therapeutic effectiveness by stimulating fascial tissue in regions with increased proprioceptive innervation (Schleip, 2015).
MyoFascial Training

Acupuncture activates proprioception
You will observe with concern how long a useful truth may be known and exist, before it is generally received and practiced on.

Benjamin Franklin
References

- Klinger, W., Schleip, R. Fascia as a body-wide tensional network: Anatomy, biomecanics and physiology. *Fascia: In Sport and Movement.* Chapter 1 Handspring Publishing 2015

References

- Schleip, R. “Fascia as a Sensory Organ” *Fascia: In Sport and Movement.* 2015
- Williams, P. *Gray’s Anatomy 38th ed.* *The Anatomical Basis of Medicine and Surgery.* Edinburg. Churchill Livinstone. 753
Suggested Reading


Suggested Reading


- Dr. Bjorn Nordenstrom https://www.youtube.com/watch?v=XKXH_4PNpCQ
Buffalo Treadmill Protocol

The patient performed an incremental treadmill exercise test following a standard Balke protocol to the first sign of symptom exacerbation.

The treadmill speed was set at 3.3 mph at 0.0% incline. After 1 minute, the grade increased to 2.0% while maintaining the same speed. At the start of the third minute and each minute thereafter, the grade increased by 1.0%, maintaining the speed at 3.3 mph. Patients were asked every minute whether they were experiencing any change in their health condition. HR (Fitbit Charge HR Large activity tracker) and rating of perceived exertion (RPE, Borg scale) were measured every minute. The test was terminated at the report of exacerbation of concussion symptoms, and the HR, systolic BP (SBP), and diastolic BP (DBP) were recorded for the threshold of symptom exacerbation.

<table>
<thead>
<tr>
<th>Speed</th>
<th>TIME (minutes)</th>
<th>Grade %</th>
<th>HR</th>
<th>BP</th>
<th>RPE (Borg)</th>
<th>Symptoms Reported</th>
</tr>
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<tbody>
<tr>
<td>3.3</td>
<td></td>
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</table>

Exercise Rx:
- 80-90% of achieved HR = target HR
- HR monitor is KEY to prevent from over-exertion
- 20 min/day at target HR (bike first, then running)
- 6-7 days/wk
- Increase target HR 5-10 bpm q1-2 weeks

Greater than or equal to 85% age-predicted max HR x 20 min without symptoms = "Physiology Recovery"

Reference:
RETURN TO PHYSICAL EXERTION PROGRESSION

Below is a guided return to exercise program that may help reduce your symptoms. However, symptom severity may evolve or improve in an unpredictable fashion, and, therefore, flexibility and close communication among you, your family and your physician is essential. It is important for you and your family to monitor symptoms and provide feedback to the medical provider if symptoms worsen or return as your exercise advances. Ideally, you are supervised by a medical professional or family member until your symptoms resolve with exercise.

EXERCISE PRESCRIPTION:

1. Exercise on a stationary bike until you get symptoms. Record your heart rate at this level of exertion and this is your target heart rate (HR).
2. Next, exercise at a HR that is a fraction of your target heart rate (established in step 1)
   a. Start at 70% of your HR that produced symptoms.
      i. A HR monitor is recommended to prevent from over-exertion.
   b. Do this for 20 minutes/day at the established HR
      i. Bike for the first week, then progress to running if applicable and able*
   c. Perform this 6-7 days/week.
   d. Increase your HR 5-10 beats per minute every 1-2 weeks until target HR reached**
3. If your symptoms worsen, stop exercise and contact us.

Note:

*Stationary biking is best since your body and head are not moving around. Once you can do the bike, then progression to running is advised. Alternatively, you can try walking on a treadmill with an incline to achieve a higher HR.

**If you are able to exercise greater than or equal to 85% of your age-predicted max HR (220 – your age) for 20 minute without symptoms then you have achieved “Physiology Recovery”.

(Printed name, Degree, Specialty)

(Physician Signature) (Date)
**What is the SCAT3?**

The SCAT3 is a standardized tool for evaluating injured athletes for concussion and can be used in athletes aged from 13 years and older. It supersedes the original SCAT and the SCAT2 published in 2005 and 2009, respectively. For younger persons, ages 12 and under, please use the Child SCAT3. The SCAT3 is designed for use by medical professionals. If you are not qualified, please use the Sport Concussion Recognition Tool. Preseason baseline testing with the SCAT3 can be helpful for interpreting post-injury test scores.

Specific instructions for use of the SCAT3 are provided on page 3. If you are not familiar with the SCAT3, please read through these instructions carefully. This tool may be freely copied in its current form for distribution to individuals, teams, groups, and organizations. Any revision or any reproduction in a digital form requires approval by the Concussion in Sport Group.

NOTE: The diagnosis of a concussion is a clinical judgment, ideally made by a medical professional. The SCAT3 should not be used solely to make, or exclude, the diagnosis of concussion in the absence of clinical judgement. An athlete may have a concussion even if their SCAT3 is “normal”.

**What is a concussion?**

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific signs and/or symptoms (some examples listed below) and most often does not involve loss of consciousness. Concussion should be suspected in the presence of any one or more of the following:

- Symptoms (e.g., headache), or
- Physical signs (e.g., unsteadiness), or
- Impaired brain function (e.g. confusion) or
- Abnormal behavior (e.g., change in personality).

**SIDELINE ASSESSMENT**

**Indications for Emergency Management**

NOTE: A hit to the head can sometimes be associated with a more serious brain injury. Any of the following warrants consideration of activating emergency procedures and urgent transportation to the nearest hospital:

- Glasgow Coma score less than 15
- Deteriorating mental status
- Potential spinal injury
- Progressive, worsening symptoms or new neurologic signs

**Potential signs of concussion?**

If any of the following signs are observed after a direct or indirect blow to the head, the athlete should stop participation, be evaluated by a medical professional and should not be permitted to return to sport the same day if a concussion is suspected.

- Any loss of consciousness?
  - Y \[ \text{Yes}\] \[ \text{N}\] \[ \text{No}\]
- “If so, how long?”
- Balance or motor incoordination (stumbles, slow/laboured movements, etc.)?
  - Y \[ \text{Yes}\] \[ \text{N}\] \[ \text{No}\]
- Disorientation or confusion (inability to respond appropriately to questions)?
  - Y \[ \text{Yes}\] \[ \text{N}\] \[ \text{No}\]
- Loss of memory?
  - “If so, how long?”
- “Before or after the injury?”
- Blank or vacant look?
  - Y \[ \text{Yes}\] \[ \text{N}\] \[ \text{No}\]
- Visible facial injury in combination with any of the above?

**1 Glasgow coma scale (GCS)**

<table>
<thead>
<tr>
<th>Best eye response (E)</th>
<th></th>
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<tbody>
<tr>
<td>No eye opening</td>
<td>1</td>
</tr>
<tr>
<td>Eye opening in response to pain</td>
<td>2</td>
</tr>
<tr>
<td>Eye opening to speech</td>
<td>3</td>
</tr>
<tr>
<td>Eyes opening spontaneously</td>
<td>4</td>
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<table>
<thead>
<tr>
<th>Best verbal response (V)</th>
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<tbody>
<tr>
<td>No verbal response</td>
<td>1</td>
</tr>
<tr>
<td>Incomprehensible sounds</td>
<td>2</td>
</tr>
<tr>
<td>Inappropriate words</td>
<td>3</td>
</tr>
<tr>
<td>Confused</td>
<td>4</td>
</tr>
<tr>
<td>Oriented</td>
<td>5</td>
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<table>
<thead>
<tr>
<th>Best motor response (M)</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>No motor response</td>
<td>1</td>
</tr>
<tr>
<td>Extension to pain</td>
<td>2</td>
</tr>
<tr>
<td>Abnormal flexion to pain</td>
<td>3</td>
</tr>
<tr>
<td>Flexion/Withdrawal to pain</td>
<td>4</td>
</tr>
<tr>
<td>Localizes to pain</td>
<td>5</td>
</tr>
<tr>
<td>Obeys commands</td>
<td>6</td>
</tr>
</tbody>
</table>

Glasgow Coma score (E + V + M) of 15

GCS should be recorded for all athletes in case of subsequent deterioration.

**2 Maddocks Score**

"I am going to ask you a few questions, please listen carefully and give your best effort."

**Modified Maddocks questions (1 point for each correct answer)**

<table>
<thead>
<tr>
<th>What venue are we at today?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Which half is it now?</td>
<td>1</td>
</tr>
<tr>
<td>Who scored last in this match?</td>
<td>0</td>
</tr>
<tr>
<td>What team did you play last week/game?</td>
<td>1</td>
</tr>
<tr>
<td>Did your team win the last game?</td>
<td>0</td>
</tr>
</tbody>
</table>

Maddocks score of 5

Maddocks score is validated for sideline diagnosis of concussion only and is not used for serial testing.

**Notes:** Mechanism of Injury (“tell me what happened”):

Any athlete with a suspected concussion should be REMOVED FROM PLAY, medically assessed, monitored for deterioration (i.e., should not be left alone) and should not drive a motor vehicle until cleared to do so by a medical professional. No athlete diagnosed with concussion should be returned to sports participation on the day of Injury.
**BACKGROUND**

Name: ___________________________ Date: ___________________________

Examiner: ________________________ Sport/team/school: ___________________________

Date/time of injury: ___________________________ Age: ___________________________

Years of education completed: ___________________________ Gender: ___________________________

Dominant hand: ___________________________ How many concussions do you think you have had in the past? Y N

How long was your recovery from the most recent concussion? ___________________________

Have you ever been hospitalized or had medical imaging done for a head injury? Y N

Have you ever been diagnosed with headaches or migraines? Y N

Do you have a learning disability, dyslexia, ADD/ADHD? Y N

Have you ever been diagnosed with depression, anxiety or other psychiatric disorder? Y N

Has anyone in your family ever been diagnosed with any of these problems? Y N

Are you on any medications? If yes, please list: ___________________________

---

**SYMPTOM EVALUATION**

**SCAT3 to be done in resting state. Best done 10 or more minutes post exercise.**

**How do you feel?**

"You should score yourself on the following symptoms, based on how you feel now."

<table>
<thead>
<tr>
<th>Symptom</th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><em>Pressure in head</em></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Neck Pain</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Nausea or vomiting</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Dizziness</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Blurred vision</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Balance problems</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sensitivity to light</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sensitivity to noise</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Feeling slowed down</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Feeling like “in a fog”</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>“Don’t feel right”</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Difficulty concentrating</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Difficulty remembering</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Fatigue or low energy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Confusion</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Drowsiness</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Trouble falling asleep</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>More emotional</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Irritability</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sadness</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Nervous or Anxious</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Total number of symptoms (Maximum possible 22)

Symptom severity score (Maximum possible 132)

Do the symptoms get worse with physical activity? Y N

Do the symptoms get worse with mental activity? Y N

<table>
<thead>
<tr>
<th>Overall rating: If you know the athlete well prior to the injury, how different is the athlete acting compared to his/her usual self?</th>
<th>no different</th>
<th>very different</th>
<th>unsure</th>
<th>N/A</th>
</tr>
</thead>
</table>

Scoring on the SCAT3 should not be used as a stand-alone method to diagnose concussion, measure recovery or make decisions about an athlete’s readiness to return to competition after concussion. Since signs and symptoms may evolve over time, it is important to consider repeat evaluation in the acute assessment of concussion.

---

**COGNITIVE & PHYSICAL EVALUATION**

**4 Cognitive assessment**

Standardized Assessment of Concussion (SAC): 1

**Orientation** (1 point for each correct answer)

- What month is it? 0 1
- What is the date today? 0 1
- What is the day of the week? 0 1
- What year is it? 0 1
- What time is it right now? (within 1 hour) 0 1

**Orientation score** of 5

**Immediate memory**

<table>
<thead>
<tr>
<th>List</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
<th>Alternative word list</th>
</tr>
</thead>
<tbody>
<tr>
<td>elbow</td>
<td>0 1 0 1 0 1</td>
<td>candle</td>
<td>baby</td>
<td>finger</td>
</tr>
<tr>
<td>apple</td>
<td>0 1 0 1 0 1</td>
<td>paper</td>
<td>monkey</td>
<td>penny</td>
</tr>
<tr>
<td>carpet</td>
<td>0 1 0 1 0 1</td>
<td>sugar</td>
<td>perfume</td>
<td>blanket</td>
</tr>
<tr>
<td>saddle</td>
<td>0 1 0 1 0 1</td>
<td>sandwich</td>
<td>sunset</td>
<td>lemon</td>
</tr>
<tr>
<td>bubble</td>
<td>0 1 0 1 0 1</td>
<td>wagon</td>
<td>iron</td>
<td>insect</td>
</tr>
</tbody>
</table>

**Immediate memory score total** of 15

**Concentration**

<table>
<thead>
<tr>
<th>List</th>
<th>Trial 1</th>
<th>Alternative digit list</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-9-3</td>
<td>0 1</td>
<td>6-2-9</td>
</tr>
<tr>
<td>3-8-1-4</td>
<td>0 1</td>
<td>3-2-7-9</td>
</tr>
<tr>
<td>6-2-9-7-1</td>
<td>0 1</td>
<td>1-5-2-8-6</td>
</tr>
<tr>
<td>7-1-8-4-6-2</td>
<td>0 1</td>
<td>5-9-3-1-4-8</td>
</tr>
</tbody>
</table>

Total of 4

**Concentration score** of 5

**5 Neck Examination**

Range of motion Tenderness Upper and lower limb sensation & strength

**Findings**

---

**6 Balance examination**

Do one or both of the following tests.

Footwear (shoes, barefoot, braces, tape, etc.)

Modified Balance Error Scoring System (BESS) testing:

Which foot was tested (i.e. which is the non-dominant foot) Left Right

Testing surface (hard floor, field, etc.)

**Condition**

- Double leg stance: Errors
- Single leg stance (non-dominant foot): Errors
- Tandem stance (non-dominant foot at back): Errors

**And/or**

Tandem gait1: Time (best of 4 trials): _______ seconds

---

**7 Coordination examination**

Upper limb coordination

Which arm was tested: Left Right

**Coordination score** of 1

---

**8 SAC Delayed Recall**

Delayed recall score of 5
INSTRUCTIONS

Words in italics throughout the SCAT3 are the instructions given to the athlete by the tester.

Symptom Scale

“You should score yourself on the following symptoms, based on how you feel now.”

To be completed by the athlete. In situations where the symptom scale is being completed after exercise, it should still be done in a resting state, at least 10 minutes post exercise.

For total number of symptoms, maximum possible is 22.
For Symptom severity score, add all scores in table, maximum possible is 22 x 6 = 132.

SAC4

Immediate Memory

“I am going to test your memory. I will read you a list of words and when I am done, repeat back as many words as you can remember, in any order.”

Trials 2 & 3:

“I am going to repeat the same list again. Repeat back as many words as you can remember in any order, even if you said the word before.”

Complete all 3 trials regardless of score on trial 1 & 2. Read the words at a rate of one per second. Score 1 pt. for each correct response. Total score equals sum across all 3 trials. Do not inform the athlete that delayed recall will be tested.

Concentration

Digits backward

“I am going to read you a string of numbers and when I am done, you repeat them back to me backwards, in reverse order of how I read them to you. For example, if I say 7-1-9, you would say 9-1-7.”

If correct, go to next string length. If incorrect, read trial 2. One point possible for each string length. Stop after incorrect on both trials. The digits should be read at the rate of one per second.

Months in reverse order

“Now tell me the months of the year in reverse order. Start with the last month and go backward. So you’ll say December, November … Go ahead”

1 pt. for entire sequence correct

Delayed Recall

The delayed recall should be performed after completion of the Balance and Coordination Examination.

“Do you remember that list of words I read a few times earlier? Tell me as many words from the list as you can remember in any order.”

Score 1 pt. for each correct response

Balance Examination

Modified Balance Error Scoring System (BESS) testing

This balance testing is based on a modified version of the Balance Error Scoring System (BESS)5. A stopwatch or watch with a second hand is required for this testing.

“I am now going to test your balance. Please take your shoes off, roll up your pant legs above ankle (if applicable), and remove any ankle taping (if applicable). This test will consist of three twenty second tests with different stances.”

(a) Double leg stance:

“The first stance is standing with your feet together with your hands on your hips and with your eyes closed. You should try to maintain stability in that position for 20 seconds. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes.”

(b) Single leg stance:

“If you were to kick a ball, which foot would you use? This will be the dominant foot. Now stand on your non-dominant foot. The dominant leg should be held in approximately 30 degrees of hip flexion and 45 degrees of knee flexion. Again, you should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes.”

(c) Tandem stance:

“Now stand heel-to-toe with your non-dominant foot in back. Your weight should be evenly distributed across both feet. Again, you should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes.”

Balance testing – types of errors

1. Hands lifted off iliac crest
2. Opening eyes
3. Step, stumble, or fall
4. Moving hip into > 30 degrees abduction
5. Lifting forehead or heel
6. Remaining out of test position > 5 sec

Each of the 20-second trials is scored by counting the errors, or deviations from the proper stance, accumulated by the athlete. The examiner will begin counting errors only after the individual has assumed the proper start position. The modified BESS is calculated by adding one error point for each error during the three 20-second tests. The maximum total number of errors for any single condition is 10. If a athlete commits multiple errors simultaneously, only one error is recorded but the athlete should quickly return to the testing position, and counting should resume once subject is set. Subjects that are unable to maintain the testing procedure for a minimum of five seconds at the start are assigned the highest possible score, ten, for that testing condition.

OPTION: For further assessment, the same 3 stances can be performed on a surface of medium density foam (e.g., approximately 50 cm x 40 cm x 6 cm).

Tandem Gait6

Participants are instructed to stand with their feet together behind a starting line (the test is best done with footwear removed). Then, they walk in a forward direction as quickly and as accurately as possible along a 38mm wide (sports tape). 3 meter line with an alternate foot heel-to-toe gait ensuring that they approximate their heel and toe on each step. Once they cross the end of the 3m line, they turn 180 degrees and return to the starting point using the same gait. A total of 4 trials are done and the best time is retained. Athletes should complete the test in 14 seconds. Athletes fail the test if they step off the line, have a separation between their heel and toe, or if they touch or grab the examiner or an object. In this case, the time is not recorded and the trial repeated, if appropriate.

Coordination Examination

Upper limb coordination

Finger-to-nose (FTN) task:

“I am going to test your coordination now. Please sit comfortably on the chair with your eyes open and your arm (either right or left) outstretched (shoulder flexed to 90 degrees and elbow and fingers extended), pointing in front of you. When I give a start signal, I would like you to perform five successive finger to nose repetitions using your index finger to touch the tip of your nose, and then return to the starting position, as quickly and as accurately as possible.”

Scoring: 5 correct repetitions in ≤ 4 seconds = 1
Note for testers: Athletes fail the test if they do not touch their nose, do not fully extend their elbow or do not perform five repetitions. Failure should be scored as 0.

References & Footnotes

1. This tool has been developed by a group of international experts at the 4th International Consensus meeting on Concussion in Sport held in Zurich, Switzerland in November 2012. The full details of the conference outcomes and the authors of the tool are published in The British Journal of Sports Medicine. 2013; Volume 47, Issue 5. The outcome paper will also be simultaneously co-published in other leading biomedical journals with the copyright held by the Concussion in Sport Group, to allow unrestricted distribution, providing no alterations are made.


**ATHLETE INFORMATION**

Any athlete suspected of having a concussion should be removed from play, and then seek medical evaluation.

**Signs to watch for**

Problems could arise over the first 24–48 hours. The athlete should not be left alone and must go to a hospital at once if they:

- Have a headache that gets worse
- Are very drowsy or can’t be awakened
- Can’t recognize people or places
- Have repeated vomiting
- Behave unusually or seem confused; are very irritable
- Have seizures (arms and legs jerk uncontrollably)
- Have weak or numb arms or legs
- Are unsteady on their feet; have slurred speech

Remember, it is better to be safe. Consult your doctor after a suspected concussion.

**Return to play**

Athletes should not be returned to play the same day of injury. When returning athletes to play, they should be medically cleared and then follow a stepwise supervised program, with stages of progression.

For example:

<table>
<thead>
<tr>
<th>Rehabilitation stage</th>
<th>Functional exercise at each stage of rehabilitation</th>
<th>Objective of each stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No activity</td>
<td>Physical and cognitive rest</td>
<td>Recovery</td>
</tr>
<tr>
<td>Light aerobic exercise</td>
<td>Walking, swimming or stationary cycling keeping intensity, 70 % maximum predicted heart rate, No resistance training</td>
<td>Increase heart rate</td>
</tr>
<tr>
<td>Sport-specific exercise</td>
<td>Skating drills in ice hockey, running drills in soccer, No head impact activities</td>
<td>Add movement</td>
</tr>
<tr>
<td>Non-contact training drills</td>
<td>Progression to more complex training drills, eg passing drills in football and ice hockey</td>
<td>Exercise, coordination, and cognitive load</td>
</tr>
<tr>
<td>Full contact practice</td>
<td>Following medical clearance participate in normal training activities</td>
<td>Restore confidence and assess functional skills by coaching staff</td>
</tr>
</tbody>
</table>

There should be at least 24 hours (or longer) for each stage and if symptoms recur the athlete should rest until they resolve once again and then resume the program at the previous asymptomatic stage. Resistance training should only be added in the later stages.

If the athlete is symptomatic for more than 10 days, then consultation by a medical practitioner who is expert in the management of concussion, is recommended.

Medical clearance should be given before return to play.

---

**CONCUSSION INJURY ADVICE**

(To be given to the person monitoring the concussed athlete)

This patient has received an injury to the head. A careful medical examination has been carried out and no sign of any serious complications has been found. Recovery time is variable across individuals and the patient will need monitoring for a further period by a responsible adult. Your treating physician will provide guidance as to this timeframe.

If you notice any change in behaviour, vomiting, dizziness, worsening headache, double vision or excessive drowsiness, please contact your doctor or the nearest hospital emergency department immediately.

Other important points:

- Rest (physically and mentally), including training or playing sports until symptoms resolve and you are medically cleared
- No alcohol
- No prescription or non-prescription drugs without medical supervision.
  - Specifically:
    - No sleeping tablets
    - Do not use aspirin, anti-inflammatory medication or sedating pain killers
    - Do not drive until medically cleared
    - Do not train or play sport until medically cleared

---

**SCAT3 SPORT CONCUSSION ASSESSMENT TOOL 3**

<table>
<thead>
<tr>
<th>Test Domain</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Symptoms of 22</td>
<td></td>
</tr>
<tr>
<td>Symptom Severity Score of 132</td>
<td></td>
</tr>
<tr>
<td>Orientation of 5</td>
<td></td>
</tr>
<tr>
<td>Immediate Memory of 15</td>
<td></td>
</tr>
<tr>
<td>Concentration of 5</td>
<td></td>
</tr>
<tr>
<td>Delayed Recall of 5</td>
<td></td>
</tr>
</tbody>
</table>

**SAC Total**

**Notes:**

Patient’s name

Date/time of injury

Date/time of medical review

Treating physician

Clinic phone number

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**Scoring Summary:**

**Date:** ____  **Date:** ____  **Date:** ____

**Number of Symptoms of 22**

**Symptom Severity Score of 132**

**Orientation of 5**

**Immediate Memory of 15**

**Concentration of 5**

**Delayed Recall of 5**

**SAC Total**

**BESS (total errors)**

**Tandem Gait (seconds)**

**Coordination of 1**

Contact details or stamp
Vestibular Ocular Motor Screening (VOMS)

Adapted from:


Total time to administer is 5 minutes

1. Baseline Symptoms assessed via a post concussion symptom scale.
2. Patient rates changes in symptoms on 0 - 10 scale for symptom provocation during any of the following:
   a. Smooth Pursuit, Saccades Horizontal, Saccades Vertical, Convergence, VOR Horizontal, VOR Vertical and Visual Motion Sensitivity

**SMOOTH PURSUIT**

Patient to follow a moving target while the patient and the examiner are seated.

Examiner holds a target at a distance of 3 ft from the patient.

The patient is instructed to maintain focus on the target as the examiner moves the target smoothly in the horizontal direction 1.5 ft to the right and 1.5 ft to the left of midline. One repetition is complete when target moves back and forth to the starting position and 2 repetitions are performed.

Horizontal: Target is moved at a rate of 2 seconds for each direction (right to left and left to right).

Vertical: Repeat at the same rate (2 seconds) moving the target vertically 1.5 ft above and 1.5 ft below midline for 2 complete repetitions up and down.

*Record: Symptom provocation for Headache, Dizziness, Nausea, Fogginess on a 0-10 scale.*
**SACCADIES Horizontal and Vertical**

Patient to follow a target between two points as quickly as possible.

Patient and the examiner are seated.

**Horizontal:** Examiner holds two single points (fingertips/ targets)

Horizontally at a distance of 3 ft from patient and 1.5 ft to the right and 1.5 ft to the left of midline so that the patient must gaze 30 degrees to the left and 30 degrees to the right. Once repetition is complete when the eyes move back and forth to the starting position. 10 repetitions are to be completed.

**Vertical:** Repeat the test with 2 points held vertically at a distance of 3 ft from the patient and 1.5 ft above and 1.5 ft below midline so that the patient must gaze 30 degrees upward and 30 degrees downward.

*Record for each direction: Headache, Dizziness, Nausea, Fogginess ratings after each test.*

**NEAR POINT OF CONVERGENCE**

Measure the ability to view a near target without double vision. The patient is seated and wearing corrective lenses (if needed).

Examiner sits in front of the patient and observes their eye movement during this test.

Patient focuses on a small target (approximately 14 font size) at arm’s length and slowly brings it toward the tip of their nose. The patient is instructed to stop moving the target when they see two distinct images or when the examiner observes an outward deviation of one eye.

The distance in cm between the target and the tip of the nose is measured and recorded (*ABNORMAL >_ to 6cm*)

*Repeat 3 times and record measures each time along with the symptom ratings for Headache, Dizziness, Nausea and Fogginess.*
VESTOBULO-OCULAR REFLEX (VOR)

Horizontal and Vertical

Assess the ability to stabilize vision as the head moves.

The patient and the examiner is seated. The examiner holds a target of approximately 14 point font size in front of the patient in midline at a distance of 3 ft.

Use a metronome to help with speed at about 180 beats/min.

**Horizontal VOR:** Patient rotates head horizontally and maintains focus on the target.

*Amplitude of movement is 20 degrees to each side. *Perform 10 revolutions.

**Vertical VOR:** Repeated with the patient moving their head vertically.

*Perform 10 revolutions.

*Record after each test (Horizontal and Vertical VOR): Headache, Dizziness, Nausea and Fogginess ratings.*

This test had the highest symptom provocation of 61%.

**VISUAL MOTION SENSITIVITY**

Test visual motion sensitivity and the ability to inhibit vestibular-induced eye movements using vision.

Patient stands with feet shoulder width apart, facing a busy area of the clinic/field/court (guard patient appropriately).

Patient holds arm outstretched and focuses on their thumb. Maintaining focus on their thumb, the patient rotates together as a unit, their head, eyes and trunk at an amplitude of 80 degrees to the left and 80 degrees to the right.

Use a metronome to ensure the speed of rotation is maintained at 50 beats/min (one beat in each direction).

5 revolutions: One revolution is from right to left to the starting position is one revolution.

*Record: Headache, Dizziness, Nausea and Fogginess ratings.*
### VOMS SCORING SHEET

Symptoms on a 0-10 point scale

<table>
<thead>
<tr>
<th>Vestibular/Oculomotor</th>
<th>Type</th>
<th>Not Tested</th>
<th>Headache</th>
<th>Dizziness</th>
<th>Nausea</th>
<th>Fogginess</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Symptoms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smooth Pursuit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saccades (Horizontal)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saccades (Vertical)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Convergence (Near Point)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VOR Horizontal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Score#1 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Score#2 cm</td>
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<td>Visual Motion Sensitivity</td>
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